

REMARKS

(1) Claims 1-35 are currently pending in the present application. Claims 19 and 28-35 were previously withdrawn. Applicants respectfully request reconsideration of Claims 1-18 and 20-27.

(2) Applicant submits that independent claims 1, 20, and 23 are clearly in condition for allowance, as will be discussed herein below. The accompanying remarks are necessary and were not presented earlier because Applicant did not fully understand the nature of Examiner's position until Applicant was advised in detail of that position by the additional supporting reasoning provided in the final rejection dated January 23, 2006. Applicant believed that the amendment filed November 29, 2005 overcame Examiner's rejections at the time. The amendments and remarks of the instant response further clarify and distinguish Applicant's invention over Examiner's grounds of rejection and supporting reasoning presented in the final office action.

(3) The Office Action cited the following references:

A. U. S. Patent 6,613,664 B2, by Barth, *et al.*, entitled *Barbed Vias For Electrical Mechanical Connection Between Conductive Layers In Semiconductor Devices* (referred to as "Barth" hereinafter);

B. U. S. Patent 6,008,114, by Li, entitled *Method Of Forming Dual Damascene Structure* (referred to as "Li" hereinafter);

C. U. S. Patent 6,436,824 B1, by Chooi, *et al.*, entitled *Low Dielectric Constant Materials For Copper Damascene* (referred to as "Chooi" hereinafter); and

D. U.S. Patent Application Publication 2005/0080286 A1, by Wang, *et al.*, entitled *Composition And Method For Low Temperature Chemical Vapor Deposition Of Silicon-Containing Films Including Silicon Carbonitride And Silicon Oxycarbonitride Films* (referred to as "Wang" hereinafter).

(4) Claims 1-7, 13, 14, and 16-18 were rejected under 35 U.S.C. § 103(a) as assertedly being unpatentable over Barth and Li. Claims 8, 10-12, 15, and 20-22 were rejected under 35 U.S.C. § 103(a) as assertedly being unpatentable over Barth/Lin in view of Chooi. Claim 9 is rejected under 35 U.S.C. § 103(a) as assertedly being unpatentable over Barth/Lin/Chooi in view of Wang. Claims 23-27 were rejected under 35 U.S.C. 103(a) as assertedly being unpatentable over Barth in view of Lin and Wang. Applicant respectfully traverses these rejections for the following reasons.

The Office Action states that “[a]lthough Barth/Li teach about the importance of having the via recess, they both fail to specify its depth. . . . Since the applicant has not established the criticality (see next paragraph) of the via-recess depth, it would have been obvious to one of ordinary skill in the art to use these values [between about 100 angstroms and about 600 angstroms] in the device of Barth/Li.”

Applicant respectfully asserts that the depth range of the via recess between about 100 angstroms and about 600 angstroms, as required by Claims 1-18 and 20-27, is indeed critical and non-obvious. To support this assertion, Applicant has provided herewith another Declaration under 37 C.F.R. § 1.132 from Chung-Shi Liu, an inventor of the inventions of Claims 1-18 and 20-27.

In the Declaration from Chung-Shi Liu, he states:

The depth of the via recess is critical to the reliability and yield of the semiconductor device formed using the inventions of Claims 1-27 of the present application. A critical depth range for the via recess is between about 100 angstroms and about 600 angstroms, to improve performance, reliability, and yield. A more optimized and preferred depth range for the via recess, within the critical depth range, is between about 150 angstroms and about 300 angstroms.

Too much via recess will damage the conductive line. If the conductive line is formed from copper, for example, as is now common practice, a via recess formed too deeply is more likely to induce copper stress migration failure. On the other hand, having the via recess too shallow is more likely to induce current

crowding and electron migration failure. Thus, the depth of the via recess is critical. . . .

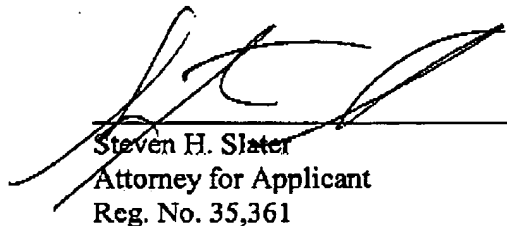
Forming a via recess in accordance with Claims 1-27 within the critical depth range produces unexpected increases in device performance, reliability, and production yield, which to the best of my knowledge is new. The prior art known to me, and the prior art cited in the office action, do not disclose this critical depth range, that this depth range is critical, and the unexpected results of using this new critical depth range.

**The Declaration also provides test results providing evidence of the criticality of the claimed range (please see table and charts in attached Declaration).** In view of this evidence of criticality, Applicant respectfully requests that the rejection of Claims 1-18 and 20-27 under 35 U.S.C. § 103(a) based on Barth/Li be withdrawn.

(5) In view of the above, Applicant respectfully submits that this response complies with 37 CFR § 1.116. Applicant further submit that the claims are in condition for allowance. No new matter has been added by this amendment. If the Examiner should have any questions, Applicant requests that the Examiner contact Applicant's attorney at the address below. No fee is believed to be due at this time. In the event that there are any fees due herein to keep the application pending, other than an issue fee, please charge the same, or credit any overpayment, to Deposit Account No. 50-1065.

Respectfully submitted,

24 APRIL 2006  
Date

  
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